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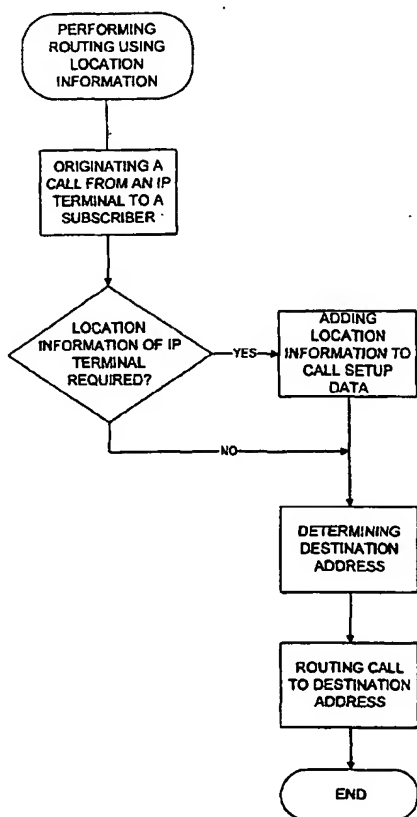
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[Continued on next page]

(54) Title: METHOD AND SYSTEM OF CALL ROUTING DEPENDING ON CALLER LOCATION IN MOBILE IP NETWORK



(57) Abstract: The present invention discloses a system and a method for performing routing using location information of an IP terminal in a mobile IP telephony network. When a call is originated from an IP terminal to another subscriber it is checked whether location information of the IP terminal is required for the call. In case location information is required, the location information is added to the call setup data. Then, a destination address is determined on the basis of the call setup data and the location information. Finally, the call is routed to the determined destination address.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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TITLE OF THE INVENTION

METHOD AND SYSTEM OF CALL ROUTING DEPENDING ON CALLER LOCATION IN MOBILE  
IP NETWORK

FIELD OF THE INVENTION

The present invention relates to the usage of subscriber  
location information in a mobile Internet protocol (IP)  
telephony network. In particular, the present invention  
relates to a method and a system for performing routing using  
location information of an IP terminal in a mobile IP  
telephony network.

BACKGROUND OF THE INVENTION

In conventional mobile circuit switched networks like GSM  
(Global System for Mobile communications) the location  
information of a mobile station is indicated to the network  
by a BSS (Base Station System). In a mobile IP telephony  
network, the mobile IP related services may be totally  
transparent to the underlying access network like GPRS  
(General Packet Radio Service) so that the access network has  
no means to provide any location information to the mobile IP  
telephony core network. Therefore, whenever there is a need  
for a mobile subscriber's location information in an IP  
telephony network, the location information (e.g. Cell ID) is  
not necessarily shown to the application that could have some  
use for it.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to  
improve application functionality in a mobile IP telephony  
network.

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According to one aspect of the present invention, this object is achieved by a system for performing routing using location information of an IP terminal in a mobile IP telephony network. This system comprises an IP terminal as a subscriber of the mobile IP telephony network and a control unit as shown in Fig. 1. Fig. 1 is a schematic block diagram showing components of a mobile IP telephony network. The control unit receives a call that is originated in the IP terminal to another subscriber. When a call is originated from the IP terminal, the IP terminal checks whether location information of the IP terminal is required for this call and adds the location information to call setup data when required. Then, when the control unit receives the call it determines the address of the called subscriber or the destination address on the basis of the call setup data and the location information and routes the call to the determined destination address.

A call control application in the IP terminal obtains the location information of the IP terminal by communicating with a mobile terminal MT connected thereto. The call control application in the IP terminal may request the location information like a Cell ID from the mobile terminal.

The call originated from the IP terminal may be directed to a special service number which requires the location information of the IP terminal. In this case, the control unit maps the special service number or alias to a subscriber or destination address on the basis of the location information.

According to another aspect of the present invention, the above-mentioned object is achieved by a method for performing routing using location information of an IP terminal in a mobile IP telephony network.

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Fig. 2 shows a flowchart of the basic steps of the method according to the present invention.

5 In a first step, a call is originated from an IP terminal of the mobile IP telephony network to another subscriber. In the next step, it is checked whether location information of the IP terminal is required for this call. When location information is required, the step of adding location  
10 information to call setup data follows. Then a subscriber or destination address is determined on the basis of the call setup data and the location information. If no location information is required, no location information is added to the call setup data and the subscriber address is determined  
15 on the basis of the call setup data alone. After the destination address has been determined, the call is routed to the determined destination address.

The location information may be provided by a communication  
20 between a call control application in the IP terminal and a dedicated mobile terminal MT.

According to a further aspect of the present invention, the object is achieved by an IP terminal in a system for  
25 performing routing using location information of the IP terminal in a mobile IP telephony network. The IP terminal is adapted to originate a call to another subscriber, wherein the IP terminal checks whether location information of the IP terminal is required for the call and adds location  
30 information to call setup data when required.

Moreover, according to a still further aspect of the present invention, the object is achieved by a control unit in a system for performing routing using location information of  
35 an IP terminal in a mobile IP telephony network. The control unit receives a call originated from an IP terminal to

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another subscriber together with call setup data comprising location information of the IP terminal. Then, the control unit determines a subscriber or destination address on the basis of the call setup data and the location information and  
5 routes the call to the determined destination address.

With the present invention, the application functionality in a mobile IP telephony network can be improved.

10 According to the present invention, subscriber location information can be obtained on request or automatically from a mobile terminal associated with the subscriber like an IP terminal. The location information can be used for a location based routing to a special subscriber or number.

15 In the following the present invention will be described by way of preferred embodiments thereof with reference to the accompanying drawings.

20 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a schematic block diagram of basic components in a mobile IP telephony network;

25 Fig. 2 shows a flowchart of the basic steps of the method according to the present invention;

Fig. 3 shows a signaling diagram illustrating a setup procedure between an IP terminal and a subscriber in location  
30 dependent routing according to a first embodiment of the present invention;

Fig. 4 shows a signaling diagram illustrating a release procedure in location dependent routing according to the  
35 first embodiment of the present invention; and

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Fig. 5 shows a signaling diagram illustrating a setup procedure between an IP terminal and a control unit in case of an emergency call according to a second embodiment of the present invention.

5

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following, a first embodiment of the present invention will be described with reference to Figs. 3 and 4. The first  
10 embodiment concerns location based routing to a special service number.

Fig. 3 shows a setup procedure in location dependent routing to a special service number using H.323 environment.  
15 According to the first embodiment of the present invention, location information of a subscriber is provided to a mobile IP telephony core network in the following way. In Fig. 3, the IP terminal IPTE requests admission from a call state control function (CSCF) using a normal H.323 procedure. To be  
20 precise, in a message 1, the subscriber IPTE sends an admission request (ARQ) with the requested bandwidth to the CSCF where the IPTE is currently registered. In a message 2, if the CSCF can accept the call it returns an admission confirm (ACF) with its own H.225.0 call signaling transport  
25 address (TA) since CSCF routed call model will be used.

The application knows that it has to get the location information of the IPTE for this call. The location information is obtained from a mobile terminal MT through an  
30 interface between the mobile aware H.323 application and the MT. Hence, in a message 3, the H.323 application inquires the MT for the current Cell ID indicating the location of the IPTE. Thereupon, in a message 4, the MT returns the Cell ID.

35 The location information is passed to the CSCF as part of the Setup message 5. In the message 5, the subscriber IPTE sends

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the Setup message to the CSCF with the special alias as destinationAddress and the Cell ID in the nonStandardData field (or in a dedicated field) in the user to user information element (UUIE) of the Setup message. Now, the  
5 CSCF has the necessary information (the alias like PizzaHut.hu and the Cell ID) in order to do the alias translation to an E.164 or alias of the nearest office or subscriber to the area where the subscriber IPTE is located. In other words, in step 6 in Fig. 3, the CSCF performs a  
10 mapping from the special service number or alias to an E.164 number or alias based on the location of the IP terminal. This is done by using a database incorporated into the CSCF, or, optionally, by forwarding the request to a database of another network.

15

In a message 7, the CSCF sends the Setup message with the new E.164 number as called party number to a Media Gateway Control Function (MGCF). Thereupon, the MGCF converts the H.323 Setup message to an Initial Address Message (IAM)  
20 carried over Sigtran and, in a message 8, sends the IAM to a Transport Signaling Gateway (T-SGW), the IAM including the new E.164 number. The T-SGW converts the Sigtran IAM to an SS7 IAM and sends it to a local exchange according to message 9. In a message 10, the local exchange initiates a call setup  
25 towards a local PizzaHut office.

When the called subscriber (the local PizzaHut office) answers the call, it sends a Connect message (message 11) to the local exchange and the local exchange acknowledges with a  
30 Connect Acknowledge (message 11). In a message 12, the local exchange sends an SS7 Answer Message (ANM) corresponding to the Connect message to the T-SGW. The T-SGW converts the SS7 ANM to a Sigtran ANM and sends it to the MGCF in a message 13. Finally, in a message 14, the MGCF sends a Connect  
35 message corresponding to the Sigtran ANM to the IPTE via the CSCF. At this point, both ways communication is possible



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between the subscriber IPTE and the called subscriber, i.e. the local PizzaHut office.

After the conversation is over and one of the parties hangs  
5 up (in this case the local PizzaHut office), a Disconnect  
message 15 (Fig. 4) is sent from the local PizzaHut office to  
the local exchange. Thereupon, a user network interface (UNI)  
channel between the local PizzaHut office and the local  
exchange is released according to message 16. Furthermore, in  
10 a message 17, a network to network interface (NNI) channel  
between the local exchange and the T-SGW is released.  
Thereafter, the resources between the T-SGW and the MGCF are  
released in a message 18. Finally, in a message 19, the  
resources between the MGCF, the CSCF and the IPTE are  
15 released.

In the following, a second embodiment of the present  
invention will be described with reference to Fig. 5. The  
second embodiment relates to an emergency call originated in  
20 the IP terminal IPTE.

In an emergency call case, the first message is an implicit  
request for the mobile terminal MT to provide the location  
information to the application. In other words, when a user  
25 of an IP terminal IPTE in a mobile IP telephony network  
initiates an emergency call by pressing for example an EC  
button on his H.323 application, the application itself first  
notifies the MT and requests an EC Packet Data Protocol (PDP)  
context establishment in a message 1, GPRS access being  
30 assumed.

In a message 2, the MT sends an activate EC PDP context  
request to an enhanced serving GPRS support node (E-SGSN) in  
order to create an access to the mobile IP telephony network.  
35 It is to be noted that the EC PDP context has to use a high

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priority and guaranteed bandwidth quality of service (QoS). The E-SGSN sends a create EC PDP context request to an enhanced gateway GPRS support node (E-GGSN) identified by an access point name (APN) pointing to the mobile IP telephony network in a message 3. After the E-GGSN has created the EC PDP context, in a message 4 it sends a response to the E-SGSN.

In a message 5, the E-SGSN indicates acceptance of the request from the MT for the EC PDP context activation. After the EC PDP context has been established, the MT sends the Cell ID to the H.323 application in a message 6 in order to put it in the nonStandardData field (or in a dedicated field) in the user to user information element (UUIE) of the Emergency Setup message.

Now that the IPTE has a high priority access to the mobile IP telephony network, it has to discover a CSCF which can serve its request. To be precise, due to the fact that the application may not know of any available CSCFs in the network, it has to perform a gatekeeper discovery procedure using H.323. Therefore, in a message 7, the IPTE sends a Gatekeeper Request (GRQ) message with an indication in the nonStandardData field (or in a dedicated field) that it requires the H.225.0 call signalling TA in a Gatekeeper Confirm(GCF) message.

All the CSCFs which can serve the IPTE have to reply with a GCF message including their H.225.0 call signalling TA in the nonStandardData field (or in a dedicated field) of the GCF message in a message 8. Since this is an emergency call, registration (registration request (RRQ), registration confirm (RCF)) and admission (ARQ, ACF) are not required. The IPTE also knows the H.225.0 call signalling TA from the GCF message so it can start sending a call control signaling. In a message 9, the IPTE sends an Emergency Setup message to the

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CSCF with the Cell ID in the nonStandardData field (or in a dedicated field) as part of the UUIE.

In step 10 in Fig. 5, the CSCF performs the necessary  
5 location based number translation and the new E.164 number of  
the nearest EC call center will be the called party number of  
the Setup message from the CSCF to an MGCF. Then, in a  
message 11, the CSCF sends the Setup message with the E.164  
number of the nearest EC call center in the called party  
10 number to the MGCF.

The messages following the message 11, i.e. the messages 12  
to 22, correspond to the messages 8 to 18 described in the  
first embodiment in connection with Figs. 3 and 4, and,  
15 hence, the description thereof will be omitted.

According to a message 23 in Fig. 5, after a Disconnect  
message has been sent from the EC call center to the local  
exchange and the respective resources between the EC call  
20 center, the local exchange, the T-SGW and the MGCF have been  
released, the resources between the MGCF, the CSCF and the  
IPTE are released.

Since the IPTE had activated a high priority and guaranteed  
25 bandwidth QoS PDP context for which it does not have to pay  
due to the EC nature, after the call has been released, the  
H.323 application sends a release notification to the MT in a  
message 24, so that the MT can deactivate the above-mentioned  
PDP context. In a message 25, a normal user initiated PDP  
30 Context Deactivation procedure is performed. Finally, the MT  
acknowledges the EC PDP Context deactivation in a message 26.

With the present invention, the application functionality in  
a mobile IP telephony network can be improved.

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According to the present invention, subscriber location information can be obtained on request or automatically from the mobile terminal residing in an IP terminal. The location information can be used for a location based routing to a  
5 special number or alias.

While the invention has been described with reference to a preferred embodiment, the description is illustrative of the invention and is not to be construed as limiting the  
10 invention. Various modifications and applications may occur to those skilled in the art without departing from the true spirit and scope of the invention as defined by the appended claims.

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CLAIMS:

1. A method for performing routing using location information of an IP terminal in a mobile IP telephony network, said  
5 method comprising the steps of, when a call is originated from an IP terminal to another subscriber:  
    checking whether location information of the IP terminal is required for the call;  
    adding location information to call setup data when  
10 required;  
    determining a destination address on the basis of the call setup data and the location information; and  
    routing the call to the determined destination address.
- 15 2. The method according to claim 1, wherein the location information is provided by a communication between a call control application in the IP terminal and a dedicated mobile terminal (MT).
- 20 3. The method according to claim 1, wherein the call is directed to a special service number requiring location information, and wherein the step of determining a destination address comprises the step of:  
    mapping the special service number or alias to a  
25 destination address on the basis of the location information.
4. A system for performing routing using location information of an IP terminal in a mobile IP telephony network, said system comprising:  
30     an IP terminal being adapted to originate a call to another subscriber; and  
    a control unit for receiving a call originated from the IP terminal and for routing the call to a destination address;  
35     wherein the IP terminal checks whether location information of the IP terminal is required for the call and

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adds location information to call setup data when required;  
and

wherein the control unit determines a destination  
address on the basis of the call setup data and the location  
5 information and routes the call to the determined destination  
address.

5. The system according to claim 4, wherein the location  
information is provided by a communication between a call  
10 control application in the IP terminal and a dedicated mobile  
terminal (MT).

6. The system according to claim 4, wherein the call  
originated from the IP terminal is directed to a special  
15 service number requiring location information, and wherein  
the control unit determines the destination address by  
mapping the special service number or alias to a destination  
address on the basis of the location information.

20 7. An IP terminal in a system for performing routing using  
location information of the IP terminal in a mobile IP  
telephony network, the IP terminal being adapted to originate  
a call to another subscriber;

wherein the IP terminal checks whether location  
25 information of the IP terminal is required for the call and  
adds location information to call setup data when required.

8. A control unit in a system for performing routing using  
location information of an IP terminal in a mobile IP  
30 telephony network, the control unit receiving a call  
originated from an IP terminal to another subscriber together  
with call setup data comprising location information of the  
IP terminal;

wherein the control unit determines a destination  
35 address on the basis of the call setup data and the location

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information and routes the call to the determined destination address.

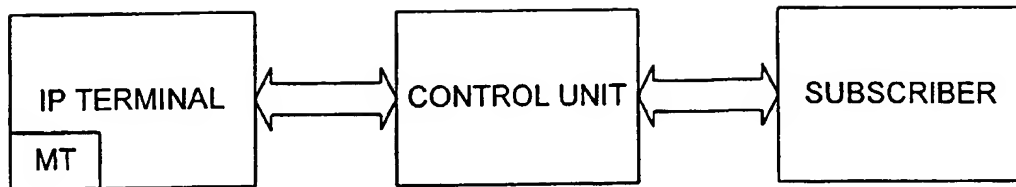


FIG. 1



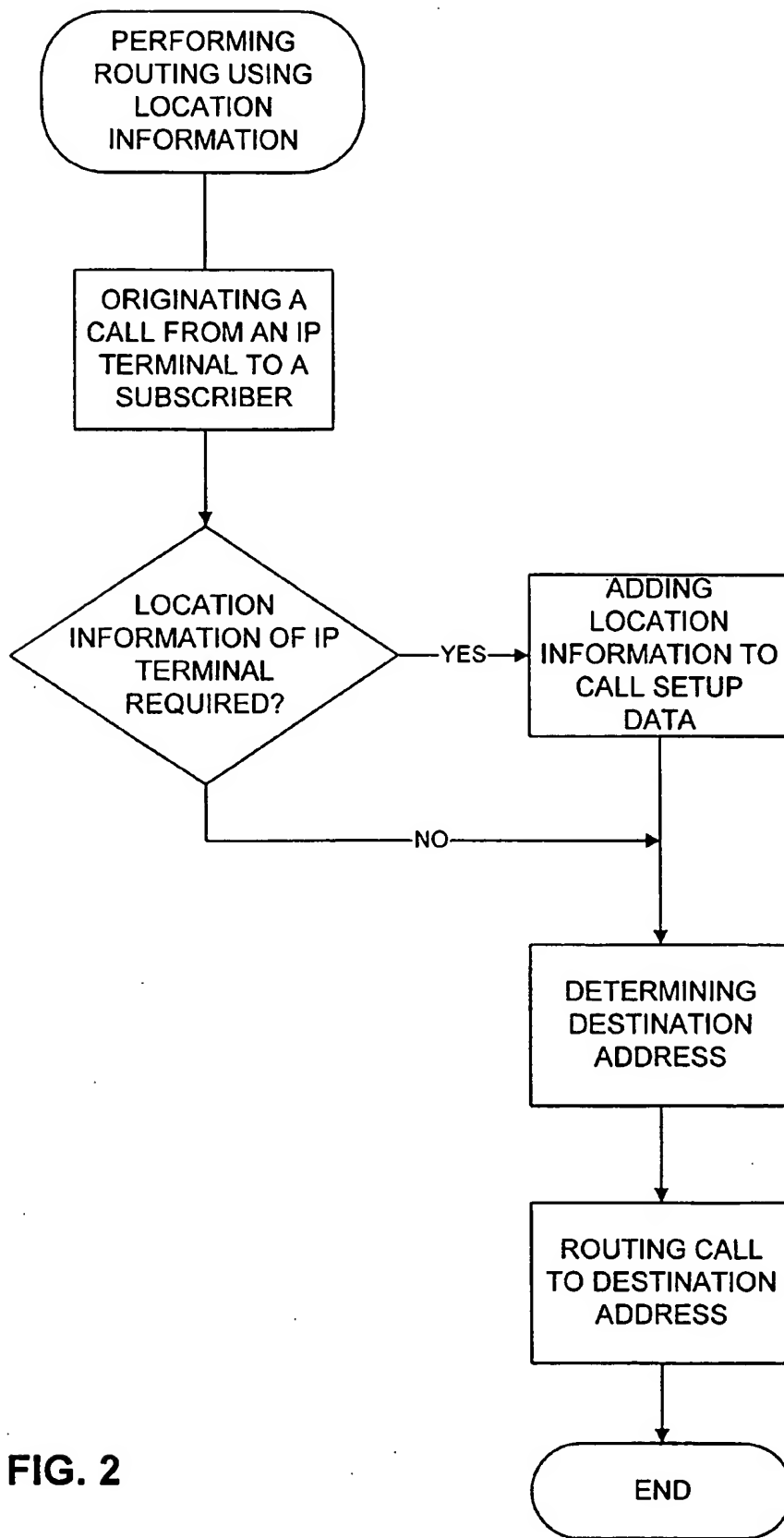


FIG. 2

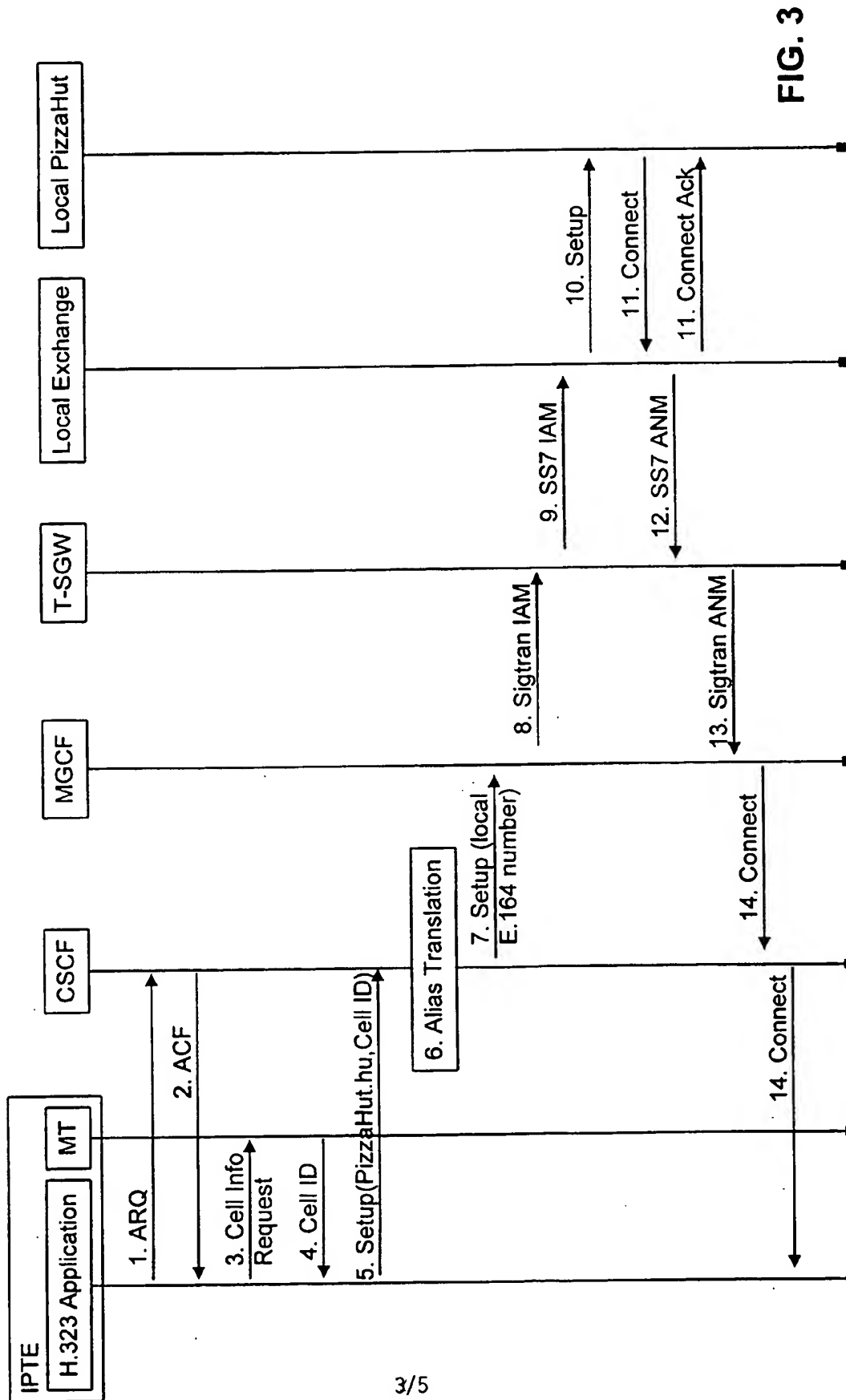


FIG. 3

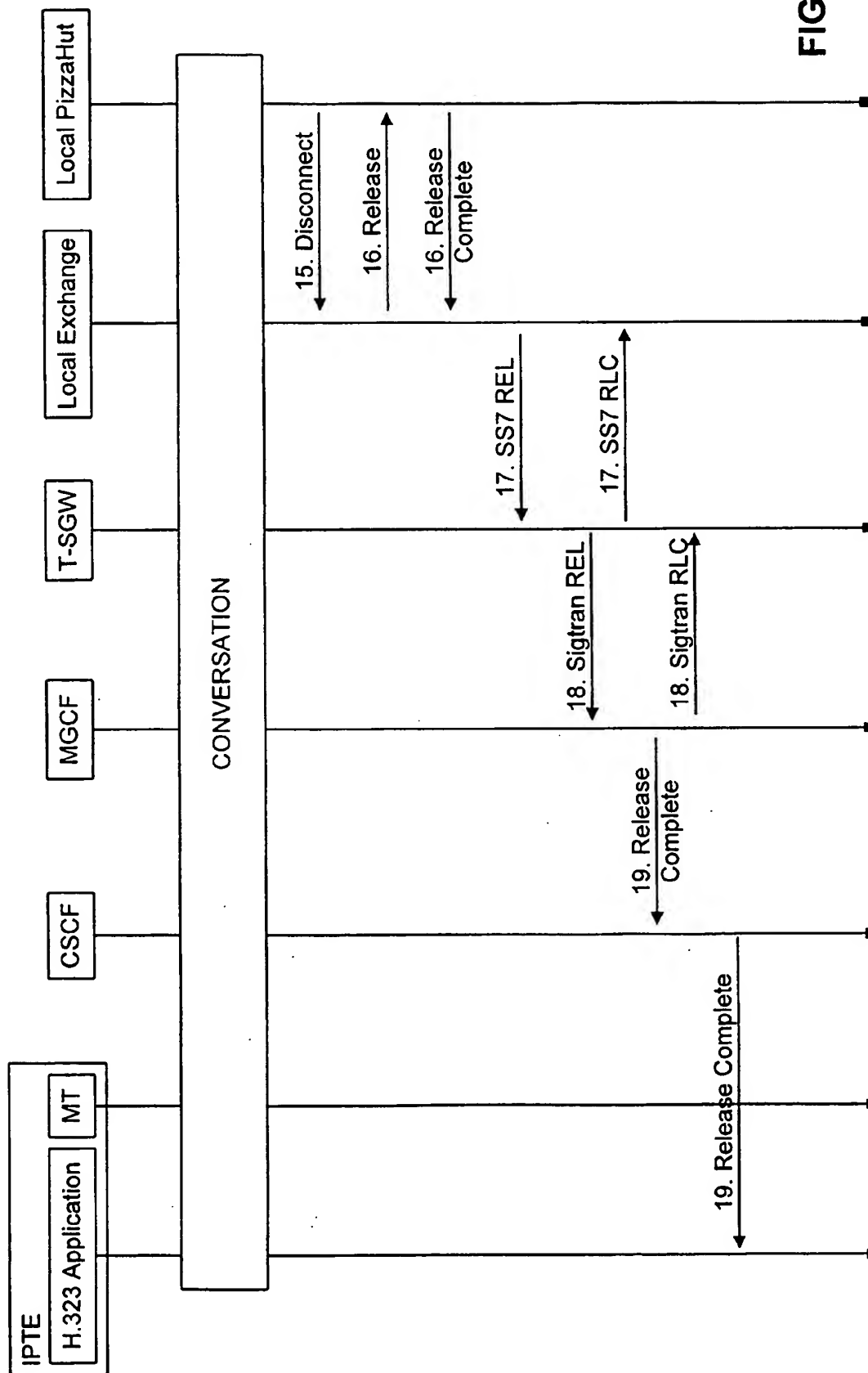


FIG. 4

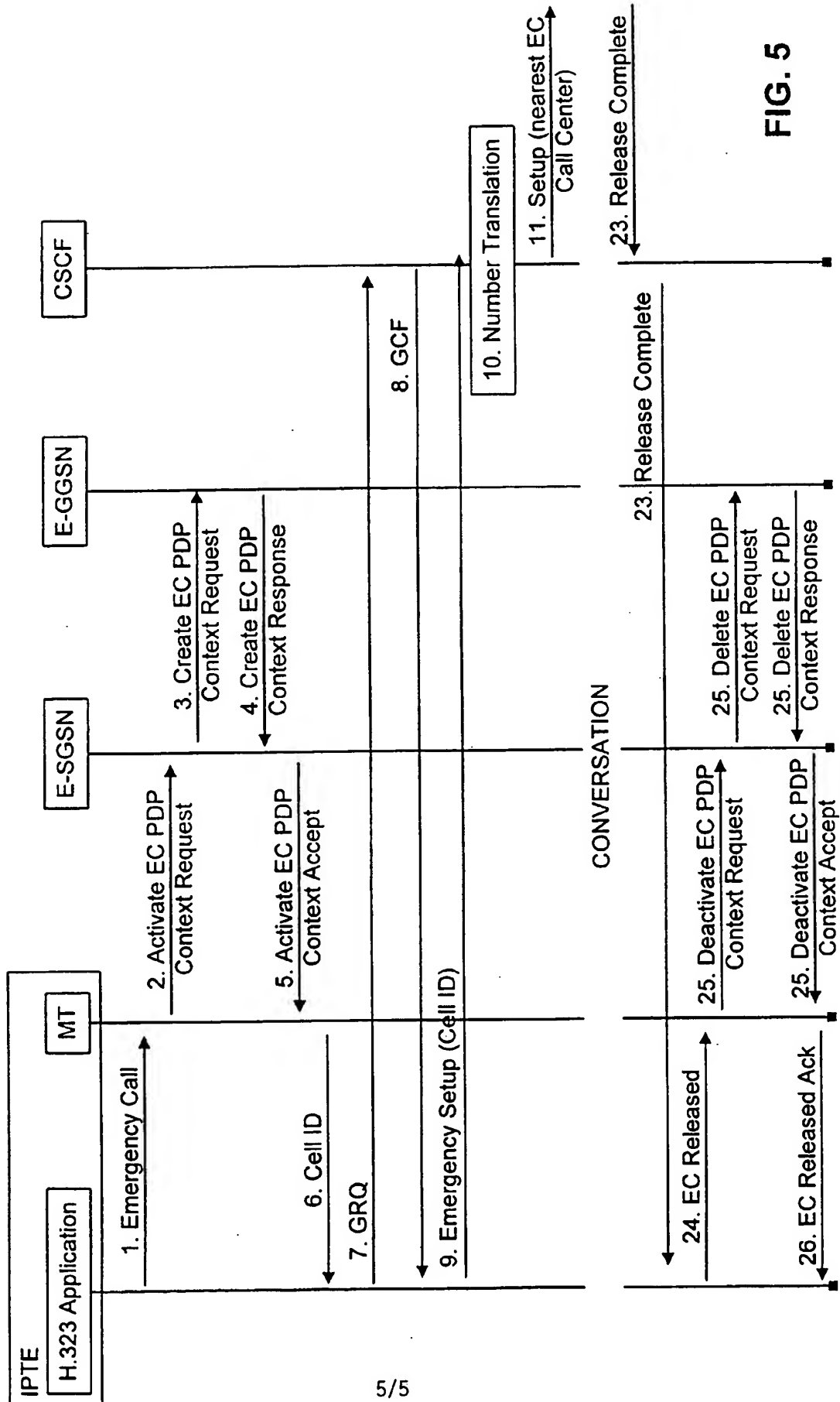


FIG. 5

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/09593

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H04L29/06 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L H04M H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 800 320 A (LUCENT TECHNOLOGIES INC) 8 October 1997 (1997-10-08)	1,3,8
A	column 1, line 54 -column 2, line 20 column 4, line 39 - line 46 ---	4,7
X	EP 0 817 444 A (SUN MICROSYSTEMS INC) 7 January 1998 (1998-01-07)	1,3,8
A	column 2, line 20 -column 3, line 1 ---	4,7
A	US 5 479 482 A (GRIMES GARY J) 26 December 1995 (1995-12-26) column 2, line 9 - line 49 ---	4,7
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search

26 July 2000

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14/08/2000

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 99/09593

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>MOH M ET AL: "Mobile IP telephony: mobility support of SIP" PROCEEDINGS EIGHT INTERNATIONAL CONFERENCE ON COMPUTER COMMUNICATIONS AND NETWORKS (CAT. NO.99EX370), PROCEEDINGS OF IC3N'99: EIGHTH INTERNATIONAL CONFERENCE ON COMPUTER COMMUNICATIONS AND NETWORKS, BOSTON, MA, USA, 11-13 OCT. 1999, pages 554-559, XP002143545 1999, Piscataway, NJ, USA, IEEE, USA ISBN: 0-7803-5794-9 page 554, column 1, line 1 - line 21 -----</p>	1,4,7,8

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information on patent family members

International Application No

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